Adaptable hydrogel networks with reversible linkages for tissue engineering.

Journal: Adv Mater

Publication Year: 2015

Authors: Huiyuan Wang, Sarah C Heilshorn

PubMed link: 25989348

Funding Grants: Injectable Hydrogels for the Delivery, Maturation, and Engraftment of Clinically Relevant Numbers of Human Induced Pluripotent Stem Cell-Derived Neural Progenitors to the Central Nervous System

Public Summary:
A newer generation of hydrogels, which are designed not to have permanent links, have become increasingly utilized to encapsulate cells in three dimension. In more traditional hydrogels, in which the links between the components are permanent, degradation of the gel has to happen before the cells that are growing in them can function properly and multiply. In contrast, these newer hydrogels are linked together by bonds that are reversible; allowing them to break and re-form as needed. This means that the cells that are cultured in these gels can function and multiply without the gel having to degrade, which in turn improves the long term stability of these gels. In this review, an overview of these newer generation of hydrogels with reversible links is discussed. Focus is especially given to reversible links that are pertinent to the field of tissue engineering.

Scientific Abstract:
Adaptable hydrogels have recently emerged as a promising platform for three-dimensional (3D) cell encapsulation and culture. In conventional, covalently crosslinked hydrogels, degradation is typically required to allow complex cellular functions to occur, leading to bulk material degradation. In contrast, adaptable hydrogels are formed by reversible crosslinks. Through breaking and re-formation of the reversible linkages, adaptable hydrogels can be locally modified to permit complex cellular functions while maintaining their long-term integrity. In addition, these adaptable materials can have biomimetic viscoelastic properties that make them well suited for several biotechnology and medical applications. In this review, an overview of adaptable-hydrogel design considerations and linkage selections is presented, with a focus on various cell-compatible crosslinking mechanisms that can be exploited to form adaptable hydrogels for tissue engineering.